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<p>(21) International Application Number: PCT/AU81/00134 (22) International Filing Date: 18 September 1981 (18.09.81) (31) Priority Application Number: PE 5624/80 (32) Priority Date: 18 September 1980 (18.09.80) (33) Priority Country: AU</p> <p>(71) Applicant (for all designated States except US): ROYAL MELBOURNE INSTITUTE OF TECHNOLOGY LIMITED [AU/AU]; 124 Latrobe Street, Melbourne, Vic. 3000 (AU).</p> <p>(72) Inventor; and (75) Inventor/Applicant (for US only): WARD, Susan, Louise [AU/AU]; Flat 8, 47 to 57 Barkly Street, Carlton, Vic. 3053 (AU).</p> <p>(74) Agent: GRANT, Michael, John; Phillips, Ormonde &amp; Fitzpatrick, 367 Collins Street, Melbourne, Vic. 3000 (AU).</p>		<p>(81) Designated States: AU, DE, DK, FI, GB, JP, NO, SE US. Published <i>With international search report</i></p>	
(54) Title: CONTAINER AND BLANK			
(57) Abstract			
<p>A container blank and knocked down container which can be erected into an enclosed container; the container has a top wall (12), a bottom wall (14), and two side walls (11, 13) joined to form a collapsed rectangular tube; flaps (15 to 22) are joined to the walls and adjacent pairs of flaps are joined together to define diagonal folding lines (25); the flaps fold outwardly during erection of the container to form end walls; the flaps (17, 18) have steps (31) in their outer edges which engage each other to inhibit collapse of the assembled container.</p>			

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This invention relates to containers that can be stored in a collapsed condition and assembled when the need for use of the container arises and also to blanks for such containers.

Most collapsed storage containers when assembled require the securing of several parts such as by stapling, gluing or applying adhesive tape to maintain the container in the assembled condition.

An object of the present invention is to provide a 10 collapsed container which may be readily assembled into a non-collapsible container without the need for securing of parts thereof other than the interlocking of parts which occurs when it is being assembled.

A further object of the present invention is to provide a container blank which can be pre-assembled to form a collapsed container according to the present invention.

According to the present invention there is provided a collapsed container which can be assembled into a hexahedral container, including two opposed top walls, two opposed side walls, each top and side wall having opposed end and side edges, each side edge being foldably joined to the adjacent side edge of the adjacent wall so as to form a collapsed rectangular tube before assembly of the hexahedral container, each end edge of each top and side wall having a flap foldably joined thereto constituting four top and four side flaps, each top flap being joined to a respective one adjacent side flap to define a diagonal folding line between the top flap and the joined side flap, each diagonal folding line being at an acute angle to the adjacent end edges of the top and side walls so that each top flap 30 is folded flat against the joined side flap in the collapsed



container and so that the flaps will fold relative to the top and side walls during assembly to form end walls of the assembled hexahedral container, each side flap including an outer edge opposite to the end edge of the side wall to which it is joined, each side flap outer edge having a locking step facing the respective flap's diagonal folding line and arranged so that in the assembled container the two locking steps at each end wall inhibit collapse of the container by engaging against each other.

10 "Top", "side" and "end" are merely convenient names to apply to the walls and do not imply orientation of the container when assembled and in use. The construction and arrangement of the top and side flaps at each end of the collapsed container enables the complete assembly of a hexahedral container by simply expanding the collapsed rectangular tube the locking steps at each end wall will engage with each other if an attempt is made to reverse the assembly process.

20 Preferably the diagonal folding line of each joined pair of top and side flaps is at substantially  $45^{\circ}$  to the adjacent end edges of the top and side walls, one flap of each joined pair of top and side flaps being provided with an integral tab folded back upon itself in the collapsed condition of the container and secured to the other flap, the other flap including a side edge nearest to said one flap and which extends at an angle of greater than  $45^{\circ}$  from the end edge of the wall to which it is joined. The  $45^{\circ}$  angle of the diagonal folding lines ensures that the end walls in the assembled container will be substantially orthogonal to top and side walls.

30 The tabs facilitate joining of the top and side flaps. The



flap with the side edge at greater than 45° to the wall end edge provides an additional strengthening thickness in the end walls of the assembled container behind the diagonal folding lines.

One of the side and top walls preferably includes an opening for receiving articles to be deposited in the assembled container. The opening preferably comprises a plurality of radial cuts in the wall and extending from a central point so that the sector-shaped flaps defined by the cuts can be deformed inwardly. With this construction of the opening, the cuts can be readily made at the time the blank is formed. Also the sector-shaped flaps will inhibit removal of the contents of the container since they will tend to return to their undeformed closed condition if withdrawal of container contents against the points of the flaps is attempted.

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The present invention also provides a container blank which can be pre-assembled into a collapsed container according to the invention, the blank including a generally rectangular panel having in order along the length of the panel a side wall, a top wall, a side wall and a top wall, four side and four top flaps extending laterally from the panel and foldably joined to respective opposite end edges of the side and top walls, each side flap being arranged to be foldably joined to a respective one adjacent top flap to define a diagonal folding line therebetween, each side flap including an outer edge opposite to the end edge of the side wall to which it is joined, each side flap outer edge having a locking step facing the respective diagonal folding line.

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An example embodiment of the present invention is shown in the accompanying drawings, in which:

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Figure 1 is a plan view of a container blank according to a preferred embodiment of the present invention,

Figure 2 is an end view of a partially collapsed container made from the blank of Figure 1, and

Figure 3 is a perspective view of an assembled container made from the blank of Figure 1.

Referring to Figure 1 the container blank includes a generally rectangular panel 10 having in order along the length of the panel a side wall 11, a top wall 12, a side wall 13 and a top wall 14. Four side flaps 15, 16, 17, 18 and four top flaps 19, 20, 21, 22 extend laterally from the panel 10 and are foldably joined to respective opposite end edges 23 of the side and top walls 15 to 22. It will be noted that the end edges 23 are shown in Figure 1 in broken line and this convention is used throughout Figure 1 to indicate fold lines which may be weakened to facilitate folding, such as by scoring.

The panel 10 can be folded to form a substantially rectangular tube. One end of the blank 10 has extending therefrom a joining flap 24 to facilitate formation of the tube.

Each side flap 15, 16, 17, 18 is arranged to be foldably joined to a respective one adjacent top flap 19, 20, 21, 22 to define a diagonal folding line 25 therebetween. Each diagonal folding line 25 defines an acute angle with the adjacent end edge 23 of the side wall 11, 13 and this acute angle is preferably 45°. The flap edges 26 remote from the acute angled edges 25 may also subtend acute angles with the adjacent wall edges 23, each latter angle preferably being greater than 45°.

Each side flap 15, 16, 17, 18 is provided with an integral tab 27 extending generally towards the adjacent top flap 19, 20, 21, 22 and arranged to be secured thereto so that



each joined side and top flap will be foldable relative to the other about the diagonal folding line 25. Adhesive may be applied to the tabs 27 prior to pre-assembly of the collapsed container. Each top flap 19, 20, 21, 22 includes a side edge 28 nearest to the tab 27 extending from the adjacent side flap 15, 16, 17, 18 and which extends at an angle of greater than 45° from the end edge 23 of the top wall 12, 14 to which it is joined. The edges 29 of top flaps 19, 20, 21, 22 extend at 45° to the end edge 23.

10            Each side flap 15, 16, 17, 18 includes an outer edge 30 opposite to the end edge 23 of the side wall 11, 13 to which it is joined, each side flap outer edge 30 having a locking step 31 facing the respective diagonal folding line 25. The locking step 31 of each side flap 15, 16, 17, 18 is defined between inner and outer edge portions of edge 30, the inner and outer edge portions being substantially parallel to the edge 23. An inclined edge portion 32 is provided between the step 31 and the outer edge portion to facilitate engagement of the locking steps 31 when the container is being assembled.

20            The top wall 12 includes an opening 33 for receiving articles to be deposited in the assembled container. The opening 33 comprises a plurality of radial cuts 34 in the wall 12 and extending from a central point 35 so that the sector-shaped flaps 36 defined by the cuts 34 can be deformed out of the plane of the wall 12.

30            The blank of Figure 1 can be pre-assembled to form a collapsed container which, in turn, can be assembled into a hexahedral container. The top walls 12, 14 and the side walls 11, 13 have side edges 37 which are foldably joined to the adjacent side edges 37 of the adjacent walls so as to form a



collapsed rectangular tube before assembly of the hexahedral container. Joining flap 24 can be secured to the portion of top wall 14 adjacent its outermost edge 37.

Each top flap 19, 20, 21, 22 is joined to a respective one adjacent side flap 15, 16, 17, 18 by means of tabs 28 and is foldable about the respective diagonal folding line 25 between the top flap 19, 20, 21, 22 and the joined side flap 15, 16, 17, 18. In the collapsed container each top flap 19, 20, 21, 22 is folded flat against the joined side flap 15, 16, 17, 18 so that the flaps will fold relative to the top and side walls 11, 12, 13, 14 during assembly to form end walls 38 of the assembled hexahedral container.

In the illustrated embodiment, each tab 27 folds back on the side flap 15, 16, 17, 18 to which it is joined and the side and top flaps 15 to 22 are arranged to be folded within the tube in the collapsed condition of the container.

During assembly of the hexahedral container from the collapsed condition, the joined top and side flaps 15 to 22 are drawn outwardly as shown in Figure 2 to form end walls 38 see Figure 3. The side flap edges 26 remain behind the adjacent top flap edges 29 so that as the container is assembled the outer edges 30 approach each other and slide over each other until the two steps 31 meet allowing the two stepped-in portions of the outer edges 30 to be adjacent. The two steps 31 are arranged to engage each other if an attempt is made to collapse the container after assembly and therefore reversal of the assembly process will be inhibited. The inclined edge portions 32 provide guide ramps between the locking steps 31 and the outer edge portion so that opposite guide ramps engage each other during assembly to facilitate meeting of the steps 31.



The container may be made of any suitable material such as cardboard.

A second embodiment of the blank and container involves only minor modifications of the blank shown in Figure 1. The top flap edges 28 adjacent the tabs 27 may be at 45° to the end edges 23 of the top walls 12, 14. In the collapsed container made from this modified blank the side and top flaps 15 to 22 extend away from the tube with the tabs 27 extending around the adjacent edge 28 of the flaps 19, 20, 21, 22 and secured to the outer face thereof. The joined top and side flaps 15 to 22 are drawn inwardly to form end walls 38 of the container as the container is assembled. The side flap edges 26 remote from their respective diagonal folding edges 25 are guided under the adjacent top flap edges 29. The outer edges 30 slide over each other until the stepped-in portions thereof are adjacent and the locking steps 31 will engage with each other to inhibit collapse of the assembled container.

Finally, it is to be understood that various alterations, modifications and/or additions may be introduced into the constructions and arrangements of parts previously described without departing from the spirit or ambit of the present invention as defined in the appended claims.



1. A collapsed container which can be assembled into a hexahedral container, including two opposed top walls, two opposed side walls, each top and side wall having opposed end and side edges, each side edge being foldably joined to the adjacent side edge of the adjacent wall so as to form a collapsed rectangular tube before assembly of the hexahedral container, each end edge of each top and side wall having a flap foldably joined thereto constituting four top and four side flaps, each top flap being joined to a respective one adjacent side flap to define a diagonal folding line between the top flap and the joined side flap, each diagonal folding line being at an acute angle to the adjacent end edges of the top and side walls so that each top flap is folded flat against the joined side flap in the collapsed container and so that the flaps will fold relative to the top and side walls during assembly to form end walls of the assembled hexahedral container, each side flap including an outer edge opposite to the end edge of the side wall to which it is joined, each side flap outer edge having a locking step facing the respective flap's diagonal folding line and arranged so that in the assembled container the two locking steps at each end wall inhibit collapse of the container by engaging against each other.
2. A collapsed container according to claim 1 wherein the diagonal folding line of each joined pair of top and side flaps is at substantially  $45^{\circ}$  to the adjacent end edges of the top and side walls, one flap of each joined pair of top and side flaps being provided with an integral tab folded back upon itself in the collapsed condition of the container and secured to the other flap, said other flap including a side edge nearest

to said one flap and which extends at an angle of greater than  $45^{\circ}$  from the end edge of the wall to which it is joined.

3. A collapsed container according to claim 1 or 2, wherein one of said side and top walls includes an opening for receiving articles to be deposited in the assembled container.

4. A collapsed container according to claim 3 wherein said opening comprises a plurality of radial cuts in the wall and extending from a central point so that the sector-shaped flaps defined by the cuts can be deformed inwardly.

5. A container blank which can be pre-assembled into a collapsed container according to claim 1, said blank including a generally rectangular panel having in order along the length of the panel a side wall, a top wall, a side wall and a top wall, four side and four top flaps extending laterally from the panel and foldably joined to respective opposite end edges of the side and top walls, each side flap being arranged to be foldably joined to a respective one adjacent top flap to define a diagonal folding line therebetween, each side flap including an outer edge opposite to the end edge of the side wall to which it is joined, each side flap outer edge having a locking step facing the respective diagonal folding line.

6. A container blank according to claim 5 wherein each side flap is provided with an integral tab extending generally towards the adjacent top flap and arranged to be secured thereto so that the joined side and top flaps will be foldable relative to each other about the diagonal folding line, the diagonal folding line being at substantially  $45^{\circ}$  to the adjacent end edges of the top and side walls, each top flap including a side edge nearest to the tab extending from the adjacent side flap and which extends at an angle of greater



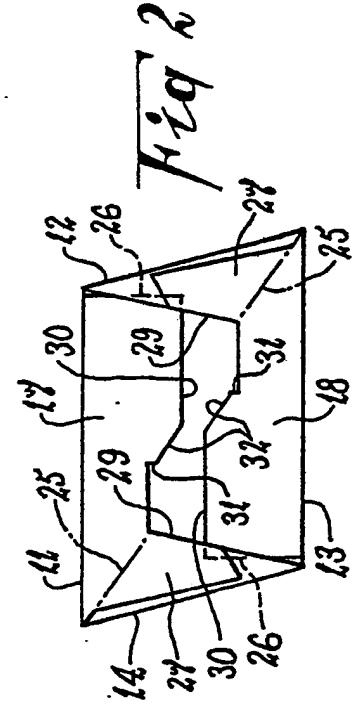
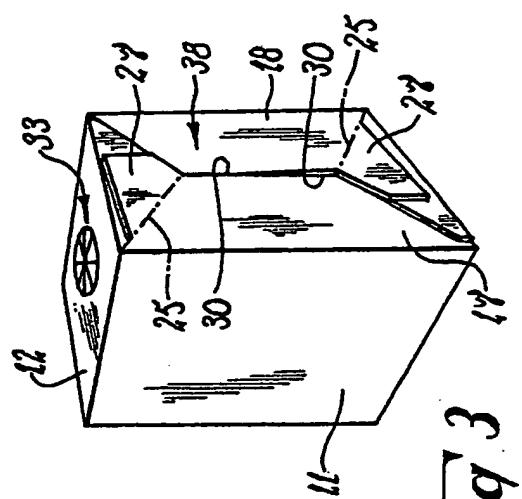
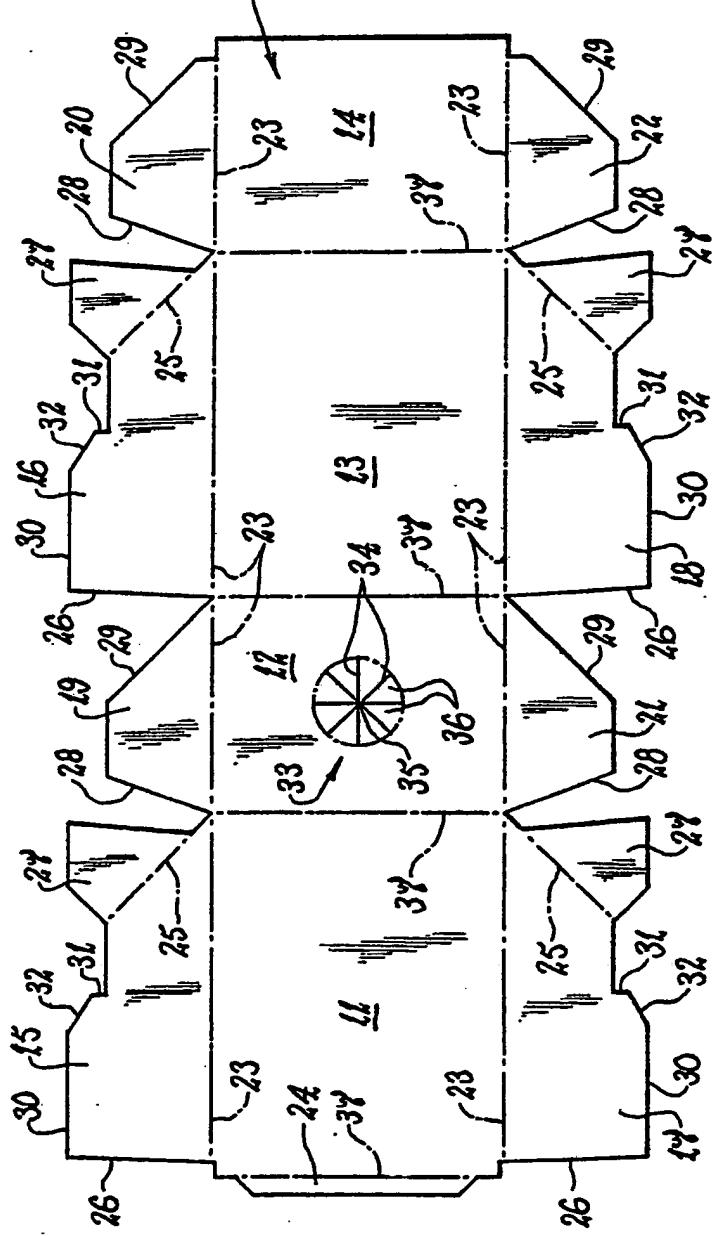
than 45° from the end edge of the top wall to which it is joined.

7. A container blank according to claim 5 or 6 wherein one of said side and top walls includes an opening for receiving articles to be deposited in the assembled container.

8. A container blank according to claim 7 wherein said opening comprises a plurality of radial cuts in the wall and extending from a central point so that the sector-shaped flaps defined by the cuts can be deformed out of the plane of the wall.



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# INTERNATIONAL SEARCH REPORT

International Application No. PCT/AU 81/00134

## I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) <sup>3</sup>

According to International Patent Classification (IPC) or to both National Classification and IPC

Int. Cl. <sup>3</sup>

B65D 5/10, 5/36, 5/42

## II. FIELDS SEARCHED

Minimum Documentation Searched <sup>4</sup>

Classification System	Classification Symbols
IPC	B65D 5/10, 5/36
US Cl.	229-37R

Documentation Searched other than Minimum Documentation  
to the Extent that such Documents are included in the Fields Searched <sup>5</sup>

AU: IPC as above; Australian Classification 57S

## III. DOCUMENTS CONSIDERED TO BE RELEVANT <sup>14</sup>

Category <sup>6</sup>	Citation of Document, <sup>16</sup> with indication, where appropriate, of the relevant passages <sup>17</sup>	Relevant to Claim No. <sup>18</sup>
X	US, A, 3494536 (HENRY) 10 February 1970(10.02.70) See figures 1-7	1 to 8
Y	GB, A, 1454746 (BOXFOLDIA LTD.) 3 November 1976 (03.11.76) See figure 1; items 22,23	1
Y	US, A, 3790064 (KRAMER) 5 February 1974 (05.02.74) See figures 1 to 5; items 32, 46	1
Y	US, A, 2332250 (O'REILLY) 19 October 1943(19.10.43) See figures 1,2,6,7,8; items 28', 29'	1

\* Special categories of cited documents: <sup>15</sup>

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## IV. CERTIFICATION

Date of the Actual Completion of the International Search <sup>9</sup>

21 October 1981(21.10.81)

Date of Mailing of this International Search Report <sup>10</sup>

29 October 1981 (29-10-81)

International Searching Authority <sup>11</sup>

Australian Patent Office

Signature of Authorized Officer <sup>12</sup>

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